IN THE CLAIMS:

Claims 1-81 (Canceled).

82. (Previously Presented) An apparatus for electric arc welding two spaced ends at a groove between said two spaced ends by melting an advancing welding wire and depositing said melted wire into said groove to join said spaced ends, said apparatus comprising a power supply to create a series of small width current pulses constituting a welding cycle, said current pulses in said cycle each having a given electrical polarity of said advancing wire with respect to said two spaced ends ; and, a selector to select the polarity of said current pulses in said cycle between a first polarity with said wire being positive and a second polarity with said wire being negative, said power supply including an inductor, a first switch to connect said inductor between said wire and said spaced ends, a second switch to connect said inductor between said wire and said spaced ends, and said selector including a switch control to close either said first switch or said second switch during a given weld cycle.

83. (Previously Presented) The apparatus as defined in claim 82, wherein said inductor is a center tapped inductor and said first switch connecting a first portion of said inductor between said wire and said plates, said second switch connecting a second portion of said inductor between said wire and said spaced ends.

84. (Previously Presented) The apparatus as defined in claim 82, wherein said selector shifts between said first polarity and said second polarity at the beginning of a welding cycle.

85. (Previously Presented) The apparatus as defined in claim 83, wherein said selector shifts between said first polarity and said second polarity at the beginning of a welding cycle.

86. (Previously Presented) The apparatus as defined in claim 82, wherein said selector includes a decoder with a first condition to select one of said first or second polarity for a first number of consecutive welding cycles and a second condition to select the other of said polarity for a second number of consecutive cycles and a regulator to alternate between said first and second conditions during a welding operation.

87. (Previously Presented) The apparatus as defined in claim 83, wherein said selector includes a decoder with a first condition to select one of said first or second polarity for a first number of consecutive welding cycles and a second condition to select the other of said polarity for a second number of consecutive cycles and a regulator to alternate between said first and second conditions during a welding operation.

88. (Previously Presented) The apparatus as defined in claim 85, wherein said selector includes a decoder with a first condition to select one of said first or second polarity for a first number of consecutive welding cycles and a second condition to select the other of said polarity for a second number of consecutive cycles and a regulator to alternate between said first and second conditions during a welding operation.

89. (Previously Presented) The apparatus as defined in claim 86, wherein said first number of consecutive welding cycles is different from said second number of consecutive welding cycles.

90. (Previously Presented) The apparatus as defined in claim 87, wherein said first number of consecutive welding cycles is different from said second number of consecutive welding cycles.

91. (Previously Presented) The apparatus as defined in claim 88, wherein said first number of consecutive welding cycles is different from said second number of consecutive welding cycles.

92. (Previously Presented) The apparatus as defined in claim 82, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

93. (Previously Presented) The apparatus as defined in claim 83, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

94. (Previously Presented) The apparatus as defined in claim 86, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

95. (Previously Presented) The apparatus as defined in claim 91, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

96. (Previously Presented) The apparatus as defined in claim 82, wherein said welding cycles each have a desired arc current, said power supply includes a shunt to sense an actual arc current and an error amplifier to compare said actual arc current with the desired arc current to control a width of said current pulses.

97. (Previously Presented) The apparatus as defined in claim 83, wherein said welding cycles each have a desired arc current, said power supply includes a shunt to sense an actual arc current and an error amplifier to compare said actual arc current with the desired arc current to control a width of said current pulses.

98. (Previously Presented) The apparatus as defined in claim 95, wherein said welding cycles each have a desired arc current, said power supply includes a shunt to sense an actual arc current and an error amplifier to compare said actual arc current with the desired arc current to control a width of said current pulses.

99. (Previously Presented) The apparatus as defined in claim 82, wherein said power supply includes a pulse width modulator to create said current pulses at a frequency of at least about 10 kHz.

100. (Previously Presented) The apparatus as defined in claim 98, wherein said power supply includes a pulse width modulator to create said current pulses at a frequency of at least about 10 kHz.

101. (Previously Presented) The apparatus as defined in claim 82, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

102. (Previously Presented) The apparatus as defined in claim 83, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

103. (Previously Presented) The apparatus as defined in claim 100, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

104. (Previously Presented) The apparatus as defined in claim 96, wherein said power

supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

105. (Previously Presented) The apparatus as defined in claim 86, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

106. (Previously Presented) The apparatus as defined in claim 87, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

107. (Previously Presented) The apparatus as defined in claim 90, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

108. (Previously Presented) The apparatus as defined in claim 97, wherein said power supply includes a rectifier that directs a rectified current into a switching invertor, said switching invertor including a switch network operated at a frequency of at least about of 18 kHz.

109. (Previously Presented) A method for electric arc welding two spaced ends at a groove between said two spaced ends by melting an advancing welding wire and depositing said melted wire into said groove to join said spaced ends, said method comprising:

(a) providing a power supply that creates a series of small width current pulses constituting a welding cycle, said current pulses in said cycle each having a given electrical polarity of said advancing wire with respect to said two spaced ends;

(b) selecting the polarity of said pulses in said cycle between a first polarity with said

wire being positive and a second polarity with said wire being negative;

(c) connecting a inductor across said wire and said spaced ends by closing a first switch;

(d) connecting said inductor across said wire and said spaced ends by closing a second switch; and,

(e) closing either said first switch or said second switch at a selected position in a given weld cycle.

110. (Previously Presented) The method as defined in claim 109, including the shifting between said first polarity and said second polarity at the beginning of a welding cycle.

111. (Previously Presented) The method as defined in claim 109, wherein said inductor is a center tapped inductor and said first switch connecting a first portion of said inductor between said wire and said spaced ends, said second switch connecting a second portion of said inductor between said wire and said spaced ends.

112. (Previously Presented) The method as defined in claim 110, wherein said inductor is a center tapped inductor and said first switch connecting a first portion of said inductor between said wire and said spaced ends, said second switch connecting a second portion of said inductor between said wire and said spaced ends.

113. (Previously Presented) The method as defined in claim 109, wherein said cycles each have a desired arc current and including the step of sensing an actual arc current and comparing said actual arc current with said desired arc current to control a width of said current pulses.

114. (Previously Presented) The method as defined in claim 110, wherein said cycles each have a desired arc current and including the step of sensing an actual arc current and comparing

said actual arc current with said desired arc current to control a width of said current pulses.

115. (Previously Presented) The method as defined in claim 112, wherein said cycles each have a desired arc current and including the step of sensing an actual arc current and comparing said actual arc current with said desired arc current to control a width of said current pulses.

116. (Previously Presented) The method as defined in claim 113, including the step of creating said current pulses at a frequency of at least about 10 kHz.

117. (Previously Presented) The method as defined in claim 115, including the step of creating said current pulses at a frequency of at least about 10 kHz.

118. (Previously Presented) The method as defined in claim 109, including selecting one of said first or second polarity for a first number of consecutive welding cycles and selecting the other of said polarity for a second number of consecutive welding cycles and alternating between said polarities during a welding operation.

119. (Previously Presented) The method as defined in claim 110, including selecting one of said first or second polarity for a first number of consecutive welding cycles and selecting the other of said polarity for a second number of consecutive welding cycles and alternating between said polarities during a welding operation.

120. (Previously Presented) The method as defined in claim 117, including selecting one of said first or second polarity for a first number of consecutive welding cycles and selecting the other of said polarity for a second number of consecutive welding cycles and alternating between said polarities during a welding operation.

121. (Previously Presented) The method as defined in claim 118, wherein said first number of consecutive welding cycles is different from said second number of consecutive welding cycles.

122. (Previously Presented) The method as defined in claim 120, wherein said first number of consecutive welding cycles is different from said second number of consecutive welding cycles.

123. (Previously Presented) The method as defined in claim 109, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

124 (Previously Presented) The method as defined in claim 110, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

125. (Previously Presented) The method as defined in claim 122, wherein at least one of said welding cycles includes a short circuit transfer portion and a plasma arc melting portion.

126. (Previously Presented) The method as defined in claim 109, including the rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.

127. (Previously Presented) The method as defined in claim 110, including the rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.

128. (Previously Presented) The method as defined in claim 125, including the

rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.

129. (Previously Presented) The method as defined in claim 128, including the rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.

130. (Previously Presented) The method as defined in claim 116, including the rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.

131. (Previously Presented) The method as defined in claim 118, including the rectification of an A.C. current and directing said rectified current into a switching invertor operating at a frequency of at least about of 18 kHz.